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# High Rates of Suicide and Attempted Suicide Using Pesticides in Nickerie, Suriname, South America

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**Abstract.** Suicide and attempted suicide are identified as a serious mental health problem in Suriname, especially in the district of Nickerie. An epidemiological study in the Nickerie catchment area revealed high rates of suicide (48 per 100,000) and attempted suicide (207 per 100,000) on average in the years 2000–2004. Particularly remarkable is the high number of attempted suicides among males (49%), and the use of pesticides in both fatal (55%) and nonfatal suicidal behavior (44%). Probably this high incidence of suicidal behavior reflects the very poor economic situation of the district, poverty of most of the population, high levels of alcohol misuse, domestic violence, the rigidity of Hindustani culture regarding family traditions, the accessibility of pesticides, and the lack of future perspectives. Health care alone will not be sufficient to tackle this problem. One of the most urgent measures to prevent suicides is to stow away pesticides in locked cabinets with the key held by the proprietor.

**Keywords:** suicide, attempted suicide, pesticides, Hindustan culture, prevention

## Introduction

In recent years hospital staff in the Nickerie Hospital noticed many attempted suicides, as well as many suicides, in numbers that were disproportionate to the size of the area being served by the hospital (37,618 population). In 2001 there were 68 attempted suicides treated at the emergency service, of which 19 resulted in death. Another 5 suicides were reported through the police and the Office of Public Health, amounting to 24 suicides (64 per 100,000). In Paramaribo and surroundings there were another 30 suicides in 2000, or around 8 per 100,000. This alarmed the health specialists and they called for and initiated an epidemiological research into suicidal behavior in the district.

Nickerie is a 5000 km<sup>2</sup> district in the west of Suriname, on the border with Guyana. Its main product is rice. The community is dependent upon agriculture; there is no industrialization, and hardly any commercial development. The economy is on a downward slope, the political situation in the country is insecure. The district population (2004) is 37,618 inhabitants of which around 40% live in the city of New-Nickerie, and 27,435 inhabitants are older

than 14 years (73%). The estimated purchasing power parity is US\$ 350 monthly. No specifications are available for the several cultural groups. Several indicators point to the fact that 60–70% (General Bureau of Statistics, 2002) of the population lives below the poverty line. Unemployment is estimated to be around 20%, but it should be realized that many workers (both male and female) work in some informal sector.

Nickerie is, after Paramaribo, the second largest town in Suriname. Suriname as a former colony of The Netherlands is a multicultural society in the north of South America. In Nickerie there are several ethnic groups such as the Creoles of African origin (25%), the Javanese, of Indonesian descent, the Hindustan population of Indian origin (70%), and other groups from neighboring regions. These ethnic groups have been brought to Suriname in the last centuries as slaves or as contract-laborers. They preserved their cultural identity through the generations. In 1975 Suriname became independent from The Netherlands. The total population now (2004) is around 481,146 people.

Mental health care in the Nickerie district is almost absent. Psychiatrists from Paramaribo do visit Nickerie bi-weekly for consultations (distance is 250 km). There are no

data available on the prevalence of mental disorders in Suriname. In Paramaribo, six psychiatrists work in the only psychiatric hospital in the country; 380 psychiatric beds are available. Suriname lacks a public and ambulatory mental health system. In principle, all people have access to the care provided by the psychiatric hospital. It is common practice that general practitioners prescribe psychotropic drugs in large amounts.

High suicide rates among Hindustan minorities have been found in Malaysia, Singapore, Fiji, Guyana en Trinidad, and the UK. Social deprivation (poverty), social fragmentation (anomia), alcoholism, family problems (especially for women), and psychiatric morbidity are frequently found as contributing factors (Bhugra, 2003; Mahy, 1993; Maniam, 2003).

The dramatic use of pesticides in underdeveloped countries is a well-known phenomenon (Bowles, 1995; Eddleston et al., 2002; Gunnel & Eddleston, 2003; Roberts et al., 2003). Suriname is no exception to that. The Ministry of Agriculture estimated (2005) that the country imports yearly almost 800,000 liters of pesticides, of which around 500,000 liters are used in its own agricultural practice. The World Health Organization has calculated that around 300,000 people annually die because of the intentional use of pesticides (Bertolotte, 2005). Legislation and control of the accessibility of pesticides seem to have a preventive effect (e.g., Bowles, 1995; Roberts et al., 2003), although the prohibition and control of one type of pesticides can lead to replacement by other types (Roberts et al., 2003).

## Method

The design of the study is an exploratory epidemiological study using death registers, hospital registers, and interviews of a sample of persons admitted to the hospital after attempted suicide. From June 2002 all cases of attempted suicide treated at the Nickerie Hospital were being monitored by the Welzijns Instituut Nickerie, following the methodology of the WHO/EURO Multicentre Study on Suicidal Behaviour (De Leo, Bille Brahe, Kerkhof, & Schmidtke, 2004; Schmidtke, Bille Brahe, De Leo, & Kerkhof, 2004). After being medically treated, attempted suicide patients were interviewed using a semistructured interview. Interviews were carried out by nurses from the Nickerie Hospital who received special training for this research project. All cases of suicide being reported to the Nickerie Police Department were compared to the numbers of suicides in Paramaribo and Suriname, as a whole, for the period 2000–2004. Data on suicides and attempted suicides in the district of Paramaribo were obtained through the Central Bureau of Statistics, the Bureau of Public Health Care, and the Academic Hospital in Paramaribo. Data on suicidal behavior and population data mainly involve the districts of Nickerie and Paramaribo.

All cases of attempted suicide were monitored using mon-

itoring forms regarding sociodemographic information, characteristics of the suicide attempt, etc. The interview contained questions regarding suicide intent, preparations, motives, and reasons for attempting suicide; previous suicidal behavior; family and living conditions; health-care service utilization, depression and well-being; alcohol and drug use; etc. These monitoring forms and interview questions were adapted from the WHO/EURO Multicentre Study on Suicidal Behaviour, in order to secure comparability of results (Schmidtke et al., 2004). In this manuscript only data comprising numbers, rates, age and gender, method, and ethnicity are being described. In a following publication detailed information on attempted suicide will be presented.

## Results

In Nickerie in 2004, 75% of all suicides, and 49% of all suicide attempts involved males (Table 1). Remarkable are the many suicides of young people: 35% of males were in the age group 16–25 years, 15% in the age group 26–35 years, and another 25% in the age group 36–45 years. Three

*Table 1.* Characteristics of suicides and attempted suicides in Nickerie, 2004

Characteristic	Suicides		Attempted suicides	
	Absolute.	%	Absolute	%
Gender				
Male	15	75	41	49
Female	5	25	43	51
Ethnicity				
Hindustan	16	80	70	83
Javanese	2	10	5	6
Creole	1	5	2	2
Indiaan	0	0	1	1
Mixed	1	5	6	7
Age				
15 and under	0	0	9	11
16–25	7	35	34	40
26–35	3	15	17	20
36–45	5	25	16	19
46–55	1	5	3	4
over 55	3	15	1	1
unknown	1	5	4	5
Method				
Pesticide intoxication	10	50	37	44
Nonpesticide intoxication	1	5	40	48
Unknown intoxication	0	0	2	2
Hanging	8	40	2	2
Gunshot	1	5	0	0
Stabbing with knife	0	0	3	4
Total	20	100	84	100

quarters of the suicides in Nickerie involved people under 46 years of age. Attempted suicide also involved mainly young people: 11% were under 16 years of age, 40% were in the age group 16–25 years, 20% in the age group of 26–35 years, and 19% in the age group 36–45 years. Around 90% of the persons attempting suicide were less than 46 years of age. Compared to the general age distribution of Nickerie, the younger age groups were overrepresented among the suicides and attempted suicides.

The prevalent methods in suicides are the use of pesticides (55% in 2004), and hanging (40%). In attempted suicides 44% involved the use of pesticides, 48% involved nonpesticide intoxication (chlorine, vinegar acid, turpentine, ammonia, nail-polish remover, and prescribed drugs), and 4% used knives. It is notable that comparatively few persons poisoned themselves with prescribed drugs (16%). The main pesticide used was Gramoxone (paraquat), a weed killer in use by all farmers in the district. Other pesticides used were Furadan, Malathion, 2,4 D and Glyphosat. Other poisons used were ant-powder and rat-poison.

Gender differences in suicide method are difficult to ascertain because of the small numbers. Yet, four of the five women used pesticides to commit suicide. The hangings occurred predominantly among older Hindustani men (55+). Among the males attempting suicide pesticide intoxication was the most prevalent (63%), while among the females nonpesticide intoxication was the most prevalent (70%) ( $\chi^2 = 19,683$ ,  $df = 2$ ,  $p < .05$ ). The method of pesticide intoxication in suicides as well as in suicide attempts is evenly distributed across the age groups.

In Nickerie in 2004, 80% of suicides and 83% of attempted suicides involved people of Hindustani descent. Since around 70% of the total population is Hindustani, this is not significantly different from the population in the district.

The numbers of suicides in the district of Nickerie decreased from 2000 to 2003, and then rose again dramatically in 2004 (see Table 2). Expressed per 100,000 of the population (all ages), the suicide rates are extremely high, equalling those of the nations in the world with the highest suicide rates. The suicide rates in Paramaribo are also ele-

*Table 3.* Attempted suicides in Nickerie, Paramaribo and Suriname: absolute numbers and rates per 100,000 (ages 15 years and older), 2002–2004

Year	Nickerie		Paramaribo		Suriname	
	Abs	Rate	Abs	Rate	Abs	Rate
2002	72	263	325	125	397	114
2003	78	284	384	148	462	132
2004	84	306	427	164	511	146
Average	78	284	379	146	457	131

Population Nickerie = 27,435, Paramaribo = 260,050, Suriname = 348,831, ages 15+; Paramaribo area includes Wanica, Para, Coronie, and Saramacca

vated, and rising. Around 16% of those who died because of suicide were known to have made previous suicide attempts. Because the registration of suicidal behavior in the rest of Suriname is lacking, the rates for Suriname as a whole are underestimations. The suicide rate of Nickerie is three times the rate of Paramaribo.

The average numbers of attempted suicides presented at general hospitals were around 78 per year for Nickerie and 379 per year for Paramaribo (see Table 3). The suicide attempt rate in Nickerie (207 per 100,000, all ages) is twice that of Paramaribo (104 per 100,000, all ages). In the Nickerie hospital it was remarkable that no single person presented him or herself twice in a year. Therefore the event rates and person rates are similar. When expressed per 100,000 of the population aged 15 years and over, in order to compare the attempt rates to international studies, the average rate in Nickerie is 284, well above many of the countries participating in the European WHO/EURO Multicentre Study into Suicidal Behaviour (Schmidtke et al., 2004), and well above the 15 + rate for the Paramaribo area (146). Again the rates for Suriname as a whole are underestimations.

## Discussion

The rates of fatal and nonfatal suicidal behavior are extremely high in the Nickerie district. Although the number of suicides is small and rates may fluctuate considerably, it still indicates a considerable health problem in this small community. The problem is most acutely manifested in the younger Hindustani population. The high male rate for attempted suicide is noteworthy; it may reflect the poor economic perspectives for those who are supposed to earn the family income. It may also reflect the heavy burden put on sons in general in Hindustani families. With the exception of hanging as a method of suicide among older Hindustani males, the prevalent means of suicide (particular among young females) and attempted suicide (among all groups) is the ingestion of pesticides. The frequent use of pesticides and other poisons reflects the agricultural character of the district. The overall impression is that suicidal acts in this district are impulsive and violent and involve primarily

*Table 2.* Suicides in Nickerie, Paramaribo, and Suriname: absolute numbers and rates per 100,000 population (all ages), 2000–2004

Year	Nickerie		Paramaribo		Suriname	
	Abs	Rate	Abs	Rate	Abs	Rate
2000	24	64	30	8	54	11
2001	19	51	53	15	72	15
2002	13	35	57	16	70	15
2003	12	32	62	17	74	15
2004	20	53	66	18	86	18
Average	18	48	54	15	71	15

Population Nickerie = 37,618, Paramaribo = 364,259, Suriname = 481,146 all ages; Paramaribo area includes Wanica, Para, Coronie, and Saramacca.

young people. Because pesticides are stored in the houses and are easily accessible, and probably also because of imitation, impulsive suicidal urges are easily acted out with dangerous compounds. Before 1979 the ingestion of full-strength vinegar-acid was a commonly used suicide method in Suriname, until the government prohibited its sale. Then the ingestion of pesticides became the most frequently used method. In a study on suicidal behavior in the Caribbean, it was shown that in countries with a dense East Indian population the most prevalent method in suicidal behavior was the ingestion of poisons, while in countries with a small Hindustani community it was the ingestion of analgesics or benzodiazepines (Mahy, 1993). This reflects a general trend in the use of pesticides in developing countries (Bowles, 1995; Eddleston et al., 2002; Gunnel & Eddleston, 2003; Roberts et al., 2003). The most urgent measure to prevent future suicides in this district might be to stow away pesticides in locked cabinets with the key held by the proprietor.

The percentage of Hindustani people among the suicidal is high (80%), but compared to the percentage of the population in Nickerie that is Hindustani (70%), and given the small numbers of suicides and attempted suicides, this difference is nonsignificant. In Paramaribo the overrepresentation of Hindustani people among the suicidal is more marked. There are reasons to believe that the Hindustani culture plays a substantial role. Probable contributors are the fixed roles for males and females, arranged marriages and the dowry system (with high risks for family problems with in-laws), the high expectations of males to provide income and protection to the extended family, and the inability to divorce. All these aspects of Hindu culture put restraints on the choices available to the individual. The precipitating factors for Hindustani suicides in Nickerie and in Suriname seem to be similar to the precipitating factors of suicides in India (Mayer & Ziaian, 2002; Vijayakumar, 2003), and the broad category of "family problems" (quarrels with spouses, in-laws, quarrels with kin) seems to be especially prevalent for females.

The collectivistic Hindu culture probably is beneficial to the group in times of poverty, but at the same time this culture may be detrimental for some individuals who cannot fulfill their expectations, and who have no alternatives to develop new orientations in life. When individual wishes conflict with family values the young may find themselves in a vulnerable position. Young adult men are supposed to follow their fathers in their farms, while girls are supposed to marry rather young. From marriage on they live in the family of their husband and have to obey the rules of their new family, especially the mother-in-law. Precipitating factors seem to be problems in interpersonal relationships rather than mental illness, although it is possible that in developing countries psychiatric disorders are underestimated (Khan, 2002). In an elaborate study of suicides and controls in Tamil Nadu, Vijayakumar (2003) did find psychopathology, alcoholism, and a family history of psychopathology to be important as well. In the Nickerie study no

information on these factors could be collected on an individual level for the suicides.

There are some similarities with suicidal behavior in India where suicidal behaviors also involve mostly young people. There is a high incidence of acts of self-harm involving organophosphate-compounds poisoning and use of insecticides or acids (Lal, 1975; Latha, 1996). Hindu religion could have some influence as well. The basic tenet of Hindu philosophy is to maintain an accepting attitude toward life, and consequently individuals may resign themselves to their current unsatisfactory situation rather than actively striving to change it. They believe their current situation is their destiny (Latha, 1996; Venkoba Rao, 2003). Yet for some the level of frustration becomes too much. The social structure in Nickerie is changing rapidly and the nuclear family cannot provide the level of support that was given by extended families. Today the social support network is much smaller, with competition being the main driving force for achievement. The Hindu culture in Nickerie probably strengthens its ties and role expectations in times of poverty. At the same time this limits the opportunities for people to find alternative ways of dealing with the economic problems. The Nickerie district has few possibilities for further education.

Until there is a substantial improvement in economic and cultural conditions, and in mental health care services, the high rates of suicidal behavior in Nickerie are likely to remain. The management of this problem requires a public policy aimed at improving health care, vocational perspectives, improving the economic situation of the district, as well as countering fixed family traditions in the Hindu culture. If nothing changes, many young males will become hopeless when they realize they will not be able to fulfill the expectations upon which their self-esteem and identity are built. This state of affairs also calls for a public health campaign promoting alternative, healthy, and safe ways of dealing with adversity. First priority would be to limit the accessibility of pesticides.

## Recommendations

Under the tenet of research informing practice, we recommend that programs be developed with the following foci: (1) better control of access to and distribution of pesticides; (2) educational programs in all levels of schools aimed at increasing the mental resilience of students when facing problems in their lives and the improvement of overall mental health for all children and youth; (3) a community campaign supported by the various media organizations that illuminates Nickerie's suicide problems and provides suggested alternatives to self-destructive behaviours (e.g., contacting a mental health worker through a 24-hour crisis line, temporary residence at a crisis center, community-based group discussions about the issues of suicide); (4) improvement of health care services; and (5) further study of how the Hindustani culture contributes to the suicide problem and what measures might



be taken to diminish that influence while respecting the dominant culture in this district.

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